## Screening of renal diseases by urine analysis in primary school aged children at El-Gharbiya governorate-Egypt

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#### Abstract

**Background:** Renal diseases are increasingly common causes of childhood morbidity and mortality. Some of these diseases, if undetected and not treated early lead to debilitating chronic disease. Urinary tract infection are common in childhood ,may be subclinical or present with non specific symptoms and signs and have the potential for long term complication.

**Objective:** to assess the urine examination findings among a group of apparently healthy primary school aged Egyptian children between 5 and 12 years old and to ascertain the magnitude of renal diseases among them.

Methodology: a cross-sectional study carried out on 706 (333boys & 373 girls) school aged children at primary school at El-Gharbiya governorate Egypt. A stratified random sample was selected from the students. All students enrolled in this study were subjected to complete clinical examination and a urine sample was taken and tested by using a urine dipstick test for protein, blood, glucose, nitrite and leukocyte in urine. Those students with persistent abnormal results with the 2<sup>nd</sup> urine dipstick test (after 15 days from 1<sup>st</sup> one) were examined by complete microscopic analysis, urine culture with antibiotic sensitivity for those with positive pus cells. **Results:** with the initial urine dipstick test, we found 116 students (16.4%) of 706 (53 boys & 63 girls) they had abnormal urinary findings. Second dipstick test done for students with positive findings and revealed that 55 (7.8%) of 706 (26 boys & 29 girls) had abnormal urinary findings, followed by microscopic urine analysis that revealed that 35 (4.96%) students had abnormal urinary findings .Urine culture was done for 24 (3.4%) students that had urinary tract infection, 13 students were positive for E-coli and 3 were positive for staphylococci while 8 showed no growth. Abdominal ultrasound was done for the 35 students with urinary abnormalities by microscopic urine analysis, it showed 3 (0.42%) students of 706 had a positive findings (2 of them had cystitis and another case had bilateral renal gravels).

**Conclusion:** Urine abnormalities are a common finding among apparently healthy school aged children with pyouria and heamaturia[ were the most prevailing abnormalities]. **Recommendation:** Urine analysis must be done for school children as a part of routine medical

examination at the point of school entry and repeated as a screening for renal diseases at a

relatively low cost providing a framework for further follow up that may help in the prevention and timely diagnosis of those with underlying renal diseases.

Keywords: Dipstick urine analysis, renal failure in school aged children, urine analysis screening

#### Introduction

Urine analysis, a simple and inexpensive test, is the cornerstone in the evaluation of the kidney function. Serious renal diseases may be present without any symptoms. Proteinuria as well as hematuria may be the early signs of renal only disease (membranous nephropathy, membranoproliferative glomerulonephritis, post infectious glomerulonephritis, IgA nephropathy and others)[11]. Also, the presence of detectable nitrites in urine has been used to diagnose urinary tract infection.

Urinary tract infection is very common in children with severe consequences on the kidney function leading to chronic kidney disease and hypertension if left untreated [6,10].

The basic dipstick method is the most rapid screening procedure that could be helpful in the early detection of renal or urinary tract diseases among apparently healthy or asymptomatic subjects in the hope of preventing and retarding progression to chronic renal failure[5,14].

Worldwide, screening for chronic kidney disease (CKD) is controversial. The primary basis for this controversy is the uncertainty whether early detection of renal disorders in childhood will lead to effective interventions and reduction in the number of individuals who develop end-stage renal disease (ESRD).

There appears to be a clear consensus among Japanese, Taiwanese, and Korean investigators that the screening programs currently in place in these countries have led early detection and effective to intervention[8,9]. This opinion is not shared by investigators from North America and Europe, but their estimates the prevalence of CKD in children predate the emergence of obesity and childhood hypertension. This may well have led to an underestimation of the prevalence of chronic kidney disease (CKD) in children[8]

Epidemiological data on the incidence and prevalence of chronic kidney disease in the pediatric population is currently limited, imprecise, and flawed by methodological differences between various data resources. It is estimated to be approximately 18 per 1 million [11]

There are considerable differences in the pattern of renal disease around the world which arise from racial variation in the susceptibility to renal disease compounded with socioeconomic factors[2]Congenital causes are responsible for the greatest percentage of cases of chronic kidney disease seen in children. Although this is the most common reported etiology from developed countries where chronic kidney disease is diagnosed in its early stages, infectious or acquired causes predominate in developing countries, where patients are referred in the later stages of kidney disease [4]

In Egypt which is a developing country, little is known about the prevalence of abnormal urinary findings in asymptomatic children. A dipstick urinalysis screening was conducted to detect such prevalence among school children in region of Egypt and to set up a more effective screening program for children in developing countries.

#### **Patients and Methods:**

a cross-sectional study carried out on 706 (333 boys &373 girls) students between ages of 5 and 12 years at a primary school at Kador village– Tanta city-El-Gharbia Governorate - Egypt..

Those apparently healthy students were screened for asymptomatic urinary abnormalities in the duration from March 2011 to May 2011.

A stratified proportionate random sampling was selected from the students, this sample was stratified by age and sex.

**Ethical consideration**: An Informed verbal consent was obtained from children's parents and school managers approval.

# All students enrolled in this study were subjected to -:

1 -Complete clinical examination with Measurement of weight, height and blood pressure .

2-Mid stream urine samples (fresh urine ( were collected from children at school and examined by using urine dipstick test strips, performed by a pediatrician at school clinic. The used dipstick strips reacts for protein, blood ,glucose, nitrite and leukocyte in urine and quickly changes color within 30 60– seconds.

3 -Students with positive urinary findings were retested after 15 days from 1st one by2nd urine dipstick test.

4 -Students with persistent abnormal urinary findings after  $2^{nd}$  dipstick test were reexamined by complete microscopic urine analysis.

5 -Abdominal U/S were done for Cases with positive urinary findings.

6 - Urine culture with antibiotic sensitivity test were done for those with positive pus cells.

7 - Cases were treated by specific treatment according to results of antibiotic sensitivity.

8 - Follow up of children by microscopic urine analysis were done after treatment.

9- Complete serum profile ,ESR,CRP, complement 3,4&renal function test, liver function tests and lipid profile was done for students with persistent urine abnormalities after treatment. 10 -Notification of the student's parents for continuo follow up and care of their children.

In this screening program, the dipstick adopted consists of 10 reagents: pH, specific gravity, protein, blood, glucose, leucocytes, nitrites, urobilinogen, bilirubin and ketones (urine quick test; Urignose 10SG<sup>™</sup>,Roche, Mannheim, Germany).

Dipstick test was performed by a pediatrician. Each reagent strip, impregnated into a chemical, reacts with the substance present in urine and quickly changes color (60-120 seconds). The color of the strip was compared to the color chart present in the bottle label.

## URINALYSIS WAS CONSIDERED ABNORMAL IF THE FOLLOWING FINDINGS WERE DETECTED:

 > 5-10 RBC/µl; hematuria (Green dots on yellow test: intact erythrocytes; Uniform green coloration of test: free hemoglobin or hemolysed erythrocytes);

• 1+ or greater proteinuria (trace, 1+, 2+, 3+, 4+ correspond to 10 mg/dl, 30 mg/dl, 100 mg/dl, 300 mg/dl, 1000 mg/dl respectively);

• 1+ or greater glycosuria (1+, 2+, 3+ corresponds to 100 mg/dl, 300 mg/dl, 1000 mg/dl respectively);

- One plus at 1 mg/dl for urobilinogen
- One plus at 15mg/dl for ketones
- Positive nitrites; and >25 WBC/µl; leukocyturia.

All abnormal urinary findings were controlled with the same dipstick brand (used in the first analysis) after 15 days as second screening. This improved the specificity of the test.

**Statistical Analysis**: Statistical analysis was done by using statistical package of social science SPSS version 16. Qualitative data were expressed in the form of numbers and percentages. Differences between groups were evaluated by chi-square test. Fisher's exact test was used for small samples.

#### RESULTS

Many renal and urinary tract disorders may be asymptomatic for a long period of time. Routine urine screening programs are recommended as a basic fundamental step in early identification of renal damage. This has proved to be extremely important in reducing the growing burden of chronic kidney disease (CKD) in both developed and developing countries.

Our findings of hematuria, proteinuria and nitrituria in school children were compared to other studies. Initial urine samples were obtained from 706 students ,among these samples 116(16.4%) showed abnormal urinary results.55 students(7.8%) showed positive results for blood,. 12 students (1.7%) were positive for protein,5 students(0.7%) were positive for both blood and protein, 1 student(0.1%) was positive for glucose,11 students (1.6%) were positive for nitrite ,32 students (4.5%) were positive for leukocyte- esterase.(tables 1,2,3,4)

#### Discussion

In our study the prevalence of urinary abnormalities detected by first dipstick test was (16.4%) which was lower than those of Plata et al. [12] who screened 14082 Bolivian students and reported that urinary abnormalities were detected in 4261 (30.3%) at firest screening ,and higher than those of Bakr et al. [3] who screened 1670 students in Dakahlaia and reported prevalence of (1.3%) at the first screening , and those of Shajari et al. [15]in Iran who reported a prevalence of (4.7%) at first screening .

Hematuria was the most common abnormality found in our studied group The development of asymptomatic microscopic hematuria is relatively common in children. Its prevalence in school aged children has been estimated at 0.5% to 2.0% depending on the population screened. [13,17]. This was comparable to our results that showed a prevalence of 7.8%,3.1% at the first and second screening respectively

The clinical significance of asymptomatic hematuria remains unclear and the merit of such an evaluation has not been confirmed. The child with persistent asymptomatic isolated microscopic hematuria of longer than 2 week duration poses a dilemma in regard to the degree of further diagnostic testing that should be performed. Based on medical recommendations, a child with persistent microscopic hematuria should be followed closely every 3 months and for one year[1]

Also proteinuria in a single urine specimen is relatively common in children with a reported prevalence of 1-10%, while persistent proteinuria is much less common[17] In this study, proteinuria was detected by 0.7% and 0.14% at first & second dipstick test respectively.

The difference in the prevalence of proteinuria among different studies might be due to the variation in the sensitivity of the dipstick test

Congenital structural abnormalities and tubular disorders occurs more commonly in children and characterized by significant excretion of low molecular weight proteins that would not be detected by testing exclusively for albumin.[17]

As regard the prevalence of combined hematuria and proteinuria was 0.7% & 0.28% at first and second tests respectively which was higher than Zainal et al. [18]);Baker et al. [3]) and Rao et al .[13] who reported aprevelance of (0.06%,0.24%,0.07%) respectively in the second test.

In our study reported glucosuria was in one student (0.14%) at first & second tests, which was lower than those of Shajari et al.[15]),( 0.2%) and Hanif et al. [7],(2%)

Nitrite was detected by 1.6% and 1.4% at first & second tests which was higher than

that found by shajari et al.[15], (0.6%) .Leukocyturia was detected by 4.5% which was higher than that found by shajari et al.[15],(0.4%) but lower than Hanif et al.[7]), (10.2%)

As regards blood pressure, 2 students (0.28%) had systolic hypertension (systolic blood pressure>95 th percentile for age), and one student (0.14%) had diastolic hypertension (diastolic blood pressure>95 th percentile for age).

In our study complete urine analysis was performed to55 students (7.8%) with persistent abnormal finding by dipstick test, only 35 students (4.6%) had urinary abnormalities, 9 students(1.27%) had isolated hematuria ,one student(0.14%) had combined hematuria and proteinuria,24 students (3.4%) had pyuria ,27 students (3.82%) had crystaluria and one student (0.14%) had glucosuria.

This results differ in percentage with other studies either decrease or increase as Abd El-Naser, [1]) who had higher percentage of hematuria,(1.69%) &glucosuria(0.2%)and he had lower percentage of combined hematuria&proteinuria(0.08%),pyuria(1%)& crystaluria(1.54%).

With comparing our study to Bakr et al.[3]he reported lower percentage of hematuria (0.36%) & higher percentage for combined hematuria & proteinuria(0.24%).

Urine culture was performed to 24 students (3.4%) with pyuria & was positive in 16 of

them. The causative organisms were E.Coli in 13 of them(1.8%) & Staphylococci in 3 students (0.42%).Other studies as in Abd El-Naser[1]) urine culture was done to 13 students (1%) with pyuria & was positive for all of them ,the causative organisms were staphylococci in 4 students (0.3%)&E.Coli in 9 students (0.7%).

Treatment of urinary tract infections with antibiotics according to culture results, &treatment of crysaluria with effervescent salts according to type of crystals was done. Complete urine examination was done15 days after treatment, 14 students (1.98%) had persistant abnormal findings, among them8 students (1.13%) had pyuria, one student (0.14%) had glucosuria ,and5 students (0.71%) had crysaluria and non had hematuria or proteinuria.

Abdominal ultrasound was done to 35 students with persistent urinary abnormalities by microscopic urine analysis , 32 students (4.5%) showed normal ultrasound,while 3 students (042%) had abnormal ultrasound as 2 cases had cystitis &one case had bilateral renal grave.

A number of recommendations regarding urinary screening as part of well child care have been published by the American Academy of Pediatrics (AAP) over the past 20 year. In 1977 and 1992, the AAP recommended a screening urinalysis at 4 periods during a child's life. In 2000, the pediatric health care guidelines were revised to recommend a screening urinalysis at 5 years of age and during adolescence. In 2007, the screening urinalysis was removed altogether[14].

It is particularly important that the prevalence data for CKD in children worldwide should be updated and additional evidence should be obtained on whether effective interventions will reduce the number of children with ESRD.

Egypt is one of the developing countries of Africa with poor socioeconomic status and poor education in its periphery where routine visits to pediatricians are infrequent. This reinforces the necessity of screening children at school entry by dipstick urine analysis.

**Conclusion:** This study helped to assess the prevalence of urinary abnormalities in school-aged children of Egypt, for the first time. Hematuria was found to be the most prevalent abnormality. The controversies over the value of urine screening in young children raise the question of whether renal diseases are more prevalent in Egyptian children and therefore it is of great importance to be identified early in the

course of disease, and whether the last AAP guideline would be modified in the near future such as screening will be limited to a selected number of children. By the time we have answers to these questions, we suggest that routine urinalysis should be part of screening of children at the school age children in Egypt further follow-up should be offered to determine the exact etiology of abnormal finding. Asymptomatic any urinary abnormalities might be detected by urine screening program at school age. Further work-up should be offered to define the exact etiology of any abnormal finding and to determine whether early detection of renal disorders in childhood will lead to effective interventions and reduction in the number of individuals who develop endstage renal disease.

**Recommendation:** Urine analysis must be done for school children as a part of routine medical examination at the point of school entry and repeated as a screening for renal diseases at a relatively low cost providing a framework for further follow up that may help in the prevention and timely diagnosis of those with underlying renal diseases. Screening of renal diseases by urine analysis....

### **Results:**

Table(1)Antibiotic sensitivity of isolated organisms

Antibiotic	Pathogen sensitivity		
name	E-coli	Staph.	
	No.=11	No.=5	
Ceftriaxone	3		
Tinam	1		
Unacine	2	1	
Fortum	2		
Sutrim	2	2	
Claforan	1		
Amikacin		1	
Rocefen		1	

Table(2) Comparison between boys &girls as regard all clinical data

Sex	BoysNo.=33	GirlsNo.=373	TotalNo.=706
Items	Mean±SD	Mean±SD	Mean±SD
Age(yrs)	9.1±2.3	8.7±.3	8.9±2.3
Weight(kg)	31.6±5.4	30.7±5.7	31.1±5.6
Height(cm)	133.6±8.6	132.1±9.2	132.8±8.8
SystolicBP(mmHg)	101.9±10.9	100.4±9.8	101.1±10.4
DiastolicBP(mmHg)	58.1±11.4	56.5±10.4	57.3±10.9

Items	Initial dipstick test		2nd dipstick test after 2weeks	
	Positive results		Positive results	
	No.	%	No.	%
RBCs	55	7.8	22	3.1
Protein	12	1.7	1	0.14
Both blood & protein	5	0.7	2	0.28
Glucose	1	0.1	1	0.14
Nitrite	11	1.6	10	1.4
Leukocyte	32	4.5	19	2.7
All urinary abnormality	116	16.4	55	7.9

## Table (3) Results of the initial and 2<sup>nd</sup> dipstick tests among the studied children

 Table (4): Comparison between results of complete microscopic urine examination before and after treatment

ltems	Positive results of urine examination before treatment		Positive results of urine examination <u>after treatment</u>	
	No.	(%)	No.	(%)
RBCs (isolated) ≥5/HPF	9	1.3	0	0
Protein (isolated) ≥ +1	1	0.1	0	0
Glucose	1	0.1	1	0.1
Both RBCs & protein	1	0.1	0	0
Pus cells ≥5/HPF	25	3.5	8	1.13
Crystals	26	3.8	5	0.7
Ureat	13	1.9	3	0.4
Oxalate	13	1.9	2	0.3
Total	63	8.9	14	1.98

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